

Dismemberment by a tamping machine: An unusual case of work-related accidental decapitation

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Abstract: We report the case of a 45-year-old railway worker who was literally decapitated during a work shift. He was working with his colleagues close to a Ballast Cleaning Machine (BCM) behind the driver. This case occurred during the night time, under artificial light that probably allowed this traumatic event. The workplace investigation revealed the victim's head and the right arm were detached from the remains of the body. Probably the cutter bar of the BCM caught his jacket and trapped him in the right arm of the machinery, cutting off his head. The external examination of the body and the following medico-legal autopsy showed excoriated streaks and de-epithelialization area on all over the body, fractures and laceration of the cervical region and of the right arm. Toxicological analyses were negative for alcohol or drug abuse. To the best of our knowledge, no other similar cases have been reported in the international literature.

Key Words: occupational accident, decapitation, ballast cleaning machine.

Work-related injuries are a social burden worldwide. Approximately 337 million people have lost their lives to occupational accidents and more than 2.3 million die of work-related accidents or diseases each year [1]. In 2011, the Italian Insurance Institute for Occupational Disease and Injury recorded the deaths of 920 Italian workers due to work-related injuries [2]. The definition of fatal accidents at work adopted by the European Statistics of Accidents at Work project is that of "accidents at work leading to the death of the victim within a year (after the day) of the accident" [3].

Overall, fatal injuries are predominantly due to traffic accidents, followed by workers falling off buildings under construction, and industrial explosions or fires [2]. Some such cases are caused by improper use of safety equipment (helmets, headsets and reflective vests), while in other cases imprudent behavior at the workplace can cause fatal accidents.

Complete decapitation is not a rare injury in situations of armed conflict but it is an uncommon finding in the civilian setting [4]. It can be the result of suicide, homicide or accidents.

Generally speaking, in occupational accidents it can happen if a worker is hit by a vehicle traveling at high speed. It is very rare during working activities involving machinery.

This case emphasizes the importance of investigation of the crime scene and autopsy in clarifying the dynamics of such an unusual injury.

MATERIALS AND METHODS

The victim was a 45-year-old railway worker. The accident happened at 00:40 AM while the man was walking to the left of the BCM near the cutter blades, checking the correct progress of operations, wearing

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appropriate safety equipment (a helmet, headset and reflective vest). The ballast machine (Fig. 1) was driven by another worker, while two other men were located on the opposite site of the railway track.



Figure 1. View of the Ballast Cleaning Machine. The arrow indicates the place where the head was found.

He was probably bent near the chain and slipped on the uneven ground, when the teeth of the chain must have caught him by the helmet or the jacket and carried him to the right arm of the BCM. Passing through the BCM, too small (45 centimeters high and 40 centimeters wide) to allow the passage of the whole body, his head was sliced from his body. The worker's colleagues saw him only when he was already decapitated.

At the workplace investigation the victim's head was found inside the right arm of the machine, while the right arm and the remains of the body were lying on the rail. There were traces of blood on the chain, inside the arm of the BCM, and on the railway.

The death occurred immediately for decapitation; the neck injuries were vital hence it is not possible to establish if he survived few seconds.

The cause of death was due to decapitation.

RESULTS

The external findings showed the head and right forearm detached from the rest of the body. The headless corpse measured 1.47 m.



Figure 2. The head with the upper one third of the trachea attached.

The longitudinal diameter of the head was 28.5 centimeters and the diameter of the laceration at the base of the neck was 15x10 cm (Fig. 2).

The laceration line passed through the high left lateral to the low right lateral and posterior part of the upper cervical region and the wound margins were irregular. The laceration present in the cervical region had a longitudinal diameter of 21.5 centimeters and transverse diameter of 16 centimeters, exposing the heart, part of the lungs, the trachea and neck vessels. The airway was severed at the trachea level. The head and neck were covered with dust (Fig. 3).



Figure 3. Laceration of the cervical region. The heart, part of the lungs, trachea and neck vessels were visible.

Excoriated streaks and de-epithelialization area were observed all over the body but mainly in the dorsal region; these injuries were due to the traction over the stones lying along the track (Fig. 4). The helmet and headset were broken.

Medico-legal autopsy revealed fractures of the left orbital bone, clavicles, sternum and ribs with muscle hemorrhages. The posterior cuts showed hemorrhages of the underlying soft tissues in the left lumbar region.

Morphological and histopathological examination of internal organs excluded previous disease that possible contributed to the traumatic event here described.

Toxicological analysis did not reveal any alcohol, psychoactive substances or addictive drug.



Figure 4. The body. Excoriated streaks and de-epithelialised areas. The right forearm was amputated.

DISCUSSION

In the context of the risks associated to maintenance activities on the railways, this case illustrates a unique case of decapitation in an occupational accident. Investigation of the scene demonstrated that the man had been working beside a BCM. This machinery consists of a tamping unit and a lifting/lowering hydraulic cylinder that packs ballast underneath railway tracks. An operator oversees these processes from the control cabin. One of the functions of the Ballast Cleaning Machine (BCM) is to collect ballast from underneath and around the sleepers using cutter blades. A conveyor belt then transfers this material to the on-board cleaning equipment. The machine then goes into reverse and the blades rotate anti-clockwise.

Investigation of the context and the scene, as well as the results of medical autopsy, are essential to make a correct differentiation among accidental, homicidal and suicidal decapitation [5]. In this case all the findings are highly indicative of accidental work-related decapitation.

Complete decapitation is a rare finding in all type of deaths.

In the suicide context, decapitation as a consequence of a violent method is always a potential factor for confusion with homicide [6]. Suicide cases include motor or vehicle-assisted suicides, railway-related suicides (under the train wheels), suicide deaths caused by explosives or a guillotine, unintentional self-decapitation as a result of hanging (caused by a putrefaction reaction), or post-mortem decapitation by domestic dogs or other animals [5, 7-13]. Decapitation due to homicide is found in cases of criminal corpse dismemberment [14]. Accidental cases include road traffic accidents (in drivers or riders of a motorcycle) or decapitation by the seat belt, occupational accidents in an agricultural, industrial, or workshop setting, or decapitation by heavy machinery [15-19].

A work-related case has been defined as “A person who was fatally injured as a result of, or who died of a fatal condition caused by, exposure to their own or others' work activity or work factors; or who was fatally injured whilst travelling to or from work” [20].

According the Italian Constitution Charta, the safety in the workplace must be guaranteed. In Italy, health and safety at work are regulated by Legislative Decree Law 81/2008 recently modified. This decree transposes in Italy the European Directive on the protection of safety and health of workers, providing for specific sanctions against defaulters [21].

In the Italian Penal Code, the work related fatalities are regulated by specific articles. The Courts begin investigation either in case of worker's death or in personal injuries with more than 20 days of prognosis or in case of a lawsuit.

In case of death due to work accident, the medico-legal investigations provide for an analytic crime scene investigation with an interview of the witnesses. In these cases autopsy are always requested by the prosecutor for establishing the cause and manner of death. Finally, it is mandatory to perform toxicological analyses.

This case occurred during the night time, under artificial light. The other workers did not see him, including the driver who in any case could not have stopped the ballast machine immediately. This factor very likely facilitated the course of events.

Occupational accident cases, like this case we report, are generally considered to be due to carelessness or simple fault of the worker and/or coworkers themselves, with no other predisposition including diseases, alcohol and drug abuse [22]. Such fatal accidents at work may be greatly reduced by improving work management, optimizing workers instruction, and calling further attention to such hazards [22].

References

1. Juan Somavia, ILO Director-General. World Day for Safety and Health at Work 2011. 28 April 2011. Ginevra.
2. INAIL. Rapporto annuale 2011. Parte quarta/statistiche Infortuni e Malattie professionali. Roma, Luglio 2012.

3. Accidents at work (ESAW, 2008 onwards). Reference Metadata in Euro SDMX Metadata Structure (ESMS). Compiling agency: Eurostat, the statistical office of the European Union.
4. Byard RW, Gilbert JD. Characteristic features of deaths due to decapitation. *Am J Forensic Med Pathol.* 2004;25(2):129-130.
5. Tsokos M, Türk EE, Uchigasaki S, Püschel K. Pathologic features of suicidal complete decapitations. *Forensic Sci Int.* 2004 28;139(2-3):95-102.
6. Zhao D, Ishikawa T, Quan L, Li D-R, Michiue T, Maeda H. Suicidal vehicle-assisted ligature strangulation resulting in complete decapitation: An autopsy report and a review of the literature. *Leg Med (Tokyo).* 2008;10(6):310-5. Epub 2008 Aug 12.
7. Samberkar PN. Motor Vehicle-Assisted Ligature Strangulation Causing Complete Decapitation: An Autopsy Report. *Am J Forensic Med Pathol.* 2012;33(1):86-87.
8. De Giorgio F, Polacco M, Pascali VL, Oliva A. Death due to railway-related suicidal decapitation: a case report. *Med Sci Law.* 2006;46(4):347-348.
9. Gahr B, Matzenauer C, Gabriel P, Ritz-Timme S. Suizid mit selbst konstruierter Guillotine. *Rechtsmedizin* 2012;22:169–171.
10. Hayashi T, Buschmann C, Tsokos M. Complete post-mortem decapitation in suicidal hanging. *Forensic Sci Med Pathol.* 2012;8(4):463-465.
11. Zhu B-L, Quan L, Ishida K, Oritani S, Taniguchi M, Fujita MQ, Fukita K, Maeda H. Decapitation in suicidal hanging - a case report with a review of the literature. *Legal Medicine.* 2000; 2 : 159-162.
12. Buschmann C, Solarino B, Püschel K, Czubaiko F, Heinze S, Tsokos M. Post-mortem decapitation by domestic dogs: three case reports and review of the literature. *Forensic Sci Med Pathol.* 2011;7:344–349.
13. Kumral B, Buyuk Y, Gundogmus UN, Sahin E, Sahin MF. Medico-legal evaluation of deaths due to decapitation. *Rom J Leg Med.* 2012; 20(4):251-254.
14. Dedouit F, Tournel G, Bécart A, Hédouin V, Gosset D. Suicidal hanging resulting in complete decapitation--forensic, radiological, and anthropological studies: a case report. *J Forensic Sci.* 2007;52(5):1190-1193.
15. Rautji R, Rudra A, Dixit V, Bhardwaj DN, Dogra TD. Decapitation in road traffic accident-a case report. *Forensic Sci Int.* 2003 27;135(3):237-238.
16. Ihama Y, Miyazaki T, Fuke C, Niki H, Maehira T. Complete decapitation of a motorcycle driver due to a roadblock chain. *Int J Legal Med.* 2008;122(6):511-515.
17. Spitz DJ, Prator PC, Stratton JE, Labiste L, Augenstein JS, Mackinnon J, Phillips J, Singer M, Perdeck E, Chimento S. Neck injuries caused by automatic two-point seat belts: an analysis of four cases. *J Forensic Sci.* 2005;50(1):159-163.
18. Demirci S, Dogan KH, Erkol Z, Gunaydin G. Accidental decapitation: a case report. *Am J Forensic Med Pathol.* 2009;30(3):270-272.
19. Ambade VN, Godbole HV, Dixit PG, Kukde HG. Accidental ligature strangulation due to crop thrasher. *J Forensic Leg Med.* 2008;15(4):263-265.
20. Driscoll TR, Harrison JE, Bradley C, Newson RS. The Role of Design Issues in Work-Related Fatal Injury in Australia. *J Safety Res.* 2008;39(2):209-214.
21. The "Code" On Health And Safety Protection Of Employees In The Workplace (Legislative Decree 81/2008).
22. Maeda H, Fujita MQ, Zhu B-L, Quan L, Kamikodai Y, Tsuda K, Taniguchi M. Labor-related fatalities in forensic postmortem investigations during the past 6 years in the southern half of Osaka city and surrounding areas. *Leg Med (Tokyo).* 2003;5 Suppl 1:S325-327.